



The Formal Representation of Administrative and Operational Relationships within Defense Organizational Constructs

Sam Chamberlain, Ph.D.

US Army Research Laboratory

In Support of The Joint Staff / J-8 / MASO

(410) 278-8948 // DSN 298

chambesc@js.pentagon.mil, or sam.chamberlain@us.army.mil

<http://www.arl.army.mil/~wildman>

Mike Boller

Science Applications International Corporation,

In Support of The Joint Staff / J-8 / MASO;

(703) 697-7285;

michael.boller@js.pentagon.mil

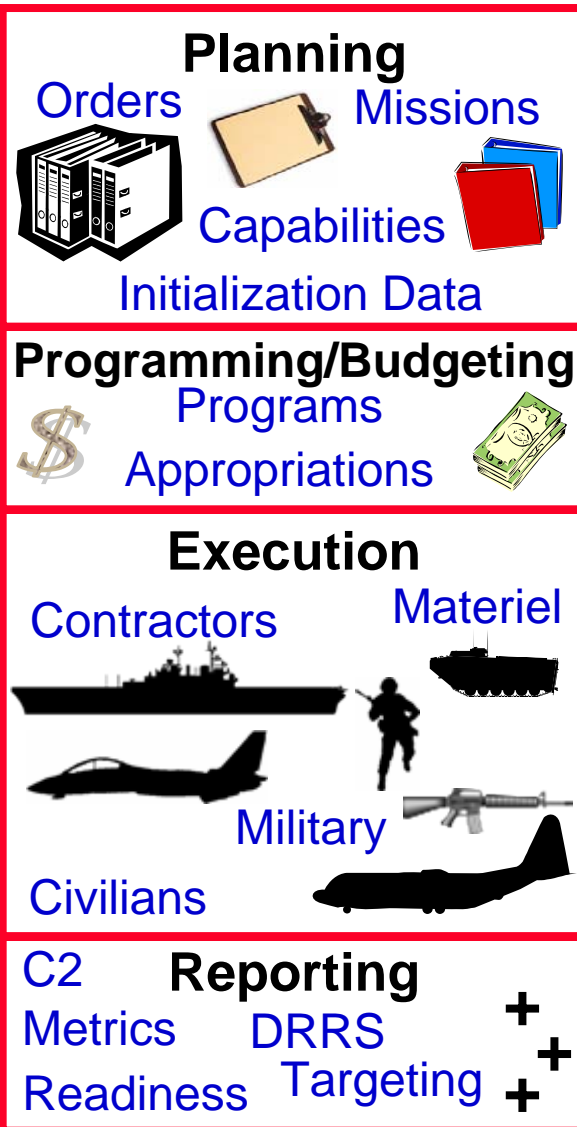
2006 CCRTS, San Diego, CA - 20 June 2006

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JUN 2006		2. REPORT TYPE		3. DATES COVERED 00-00-2006 to 00-00-2006	
4. TITLE AND SUBTITLE The Formal Representation of Administrative and Operational Relationships within Defense Organizational Constructs			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Army Research Laboratory,ATTN: AMSRL-IS-C,Aberdeen Proving Ground,MD,21005-5067			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 23	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

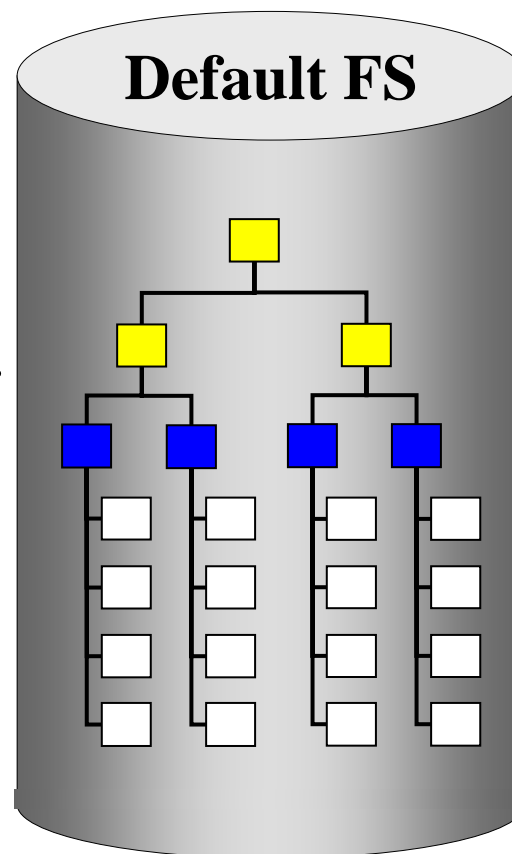
Topics

1. *Introduction – The Global Force Management Data Initiative*
2. *DOD Levels of Authority & Command and Support Relationships*
3. *The Organizational and Force Structure Construct (OFSC)*
 - *Organizations, Units, Associations*
 - *Relations*
4. *Default Relations in the OFSC*
 - *Has-Admin/Default and Is-Led-By/Default Associations*
 - *Command and Control/Default Associations*
 - *Combatant Command/Default Associations*
 - *Operational Associations – Operational Control (OPCON)*
5. *Summary*

Basic Global Force Management (GFM) Tenet: *“Force structure pulls everything together.”*



Uses Force Structure to integrate data



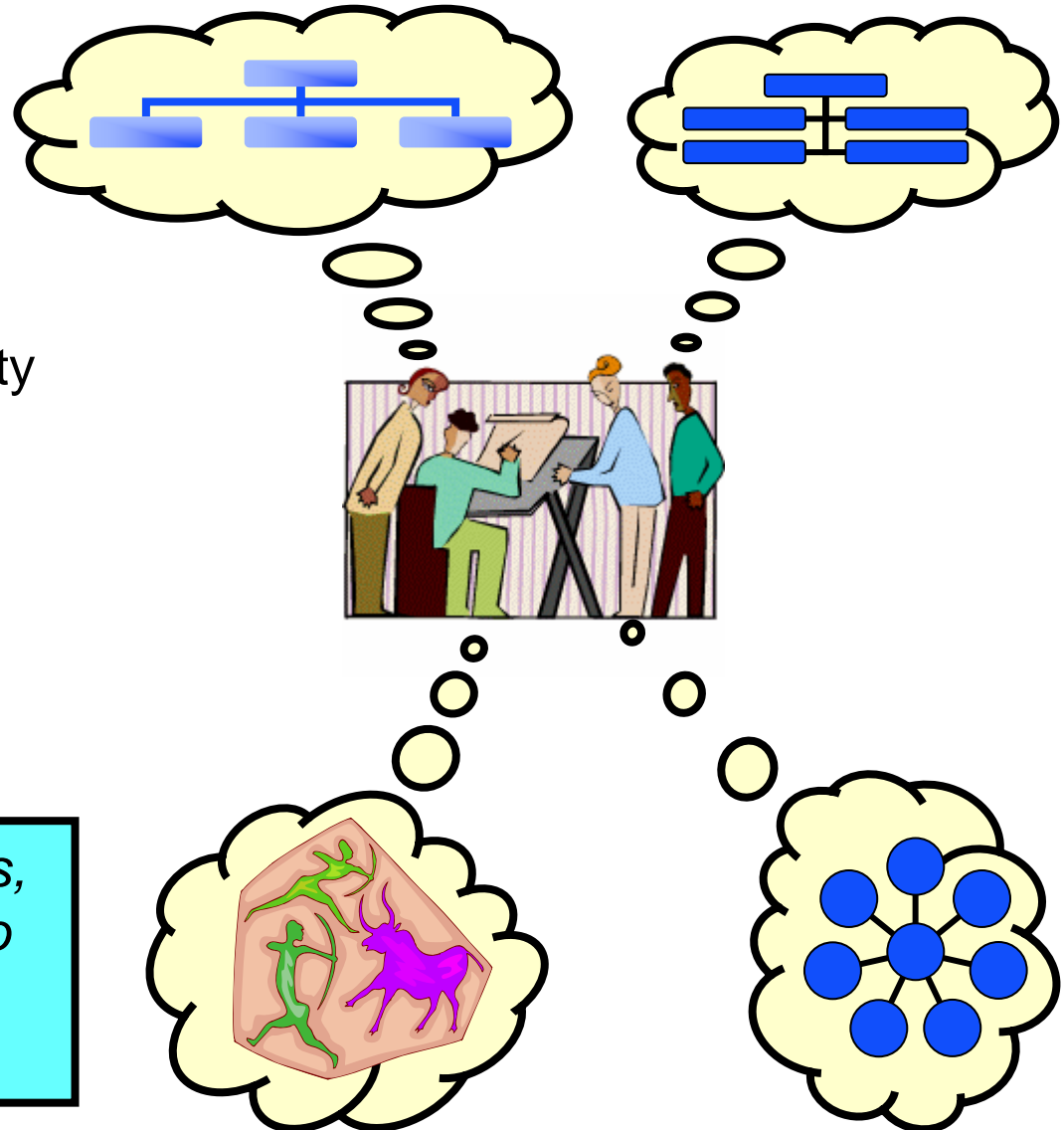
- **Not *just* an “IT problem”**
 - No “silver bullet”
 - Must create the data
- **Document all organizations**
 - Administrative
 - Combatant
 - Operational
 - Functional
 - Same “start point” for all systems
- **Uniquely identify (XML & FMIDS)**
- **Disseminate from a single authoritative data source**

Ask 20 people to draw
their org chart...

How many will be the
same?

- An organization is a virtual entity
- it doesn't physically exist
- Organizations are aggregation points for People & Equipment
- There is nothing to ensure consistency

The OFSC provides the rules, semantics, and definitions to provide consistent Force Structure



Assignment: Not in the DoD dictionary (JP 1-02),
but a well-known term. Assignment is the focus of this paper.

Allocation: In a general sense, distribution of limited resources
among competing requirements for employment.
Specific allocations (e.g., air sorties, nuclear weapons, forces, and
transportation) are described as allocation of air sorties, nuclear
weapons, etc.

Apportionment: In the general sense, distribution for *planning* of
limited resources among competing requirements.
Specific apportionments (e.g., air sorties and forces for planning) are
described as apportionment of air sorties and forces for planning, etc.

From:

Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*
12 April 2001 (As Amended Through 31 August 2005)

Proposed term: Assignment - The process of assigning forces.

Assigned Forces:

Those forces and resources that have been placed under the Combatant Command (Command Authority) of a Unified Commander by the direction of the Secretary in his “Forces for Unified Commands Memorandum” IAW Title 10 USC §162. Forces and resources so assigned are available for normal peacetime operations of that command.

From: Global Force Management Guidance, 4 May 2005, p. A-2-1

Title 10 §162(a):

Assignment of Forces. --

(1) Except as provided in paragraph (2), the Secretaries of the military departments shall assign all forces under their jurisdiction to unified and specified combatant commands ... to perform missions assigned to those commands.

A. ADCON [Administrative Control]

B. Command Relationships

- 1. COCOM [Combatant Command (Command Authority)]**
- 2. OPCON [Operational Control]**
- 3. TACON [Tactical Control]**
- 4. Support**
 - a. General**
 - b. Mutual**
 - c. Direct**
 - d. Close**

C. Coordinating Authority

D. DIRLAUTH [Direct Liaison Authorized]

Organizational and Force Structure Construct (OFSC):

In this case, the term “construct” refers to the noun version: “**A concept, model, or schematic idea.**” The OFSC is the theory and mathematical formalisms that describe how organization trees are represented in the DOD. “Construct” does NOT refer to an instance of a tree (as is often mistakenly done).

Global Force Management Information Exchange Data Model (GFMIEDM):

The specification of how data will be exchanged between the suite of GFM organization servers (OS) and other systems that require GFM data. There are many techniques used to build interface specifications, information exchange data models (IEDM) are but one. This technique was chosen because of the significant amount of intellectual effort already expended to create the MIP* (that now includes a NATO team) Command and Control IEDM, or C2IEDM, that has been adopted for coalition interoperability by 16 (now 23) countries. Many of the entities required for GFM already existed in the C2IEDM; thus, the GFMIEDM is an augmented subset of the C2IEDM and this enables simultaneous coalition interoperability.

The OFSC and GFMIEDM are not one in the same.

Many OFSC terms and formalisms are not transferred to the GFMIEDM. This is because the GFMIEDM contains the MINIMUM set of information required. The OFSC provides the rationale behind the choice of GFMIEDM entities and attributes and forms the basis of the semantics to be used with the GFMIEDM data.

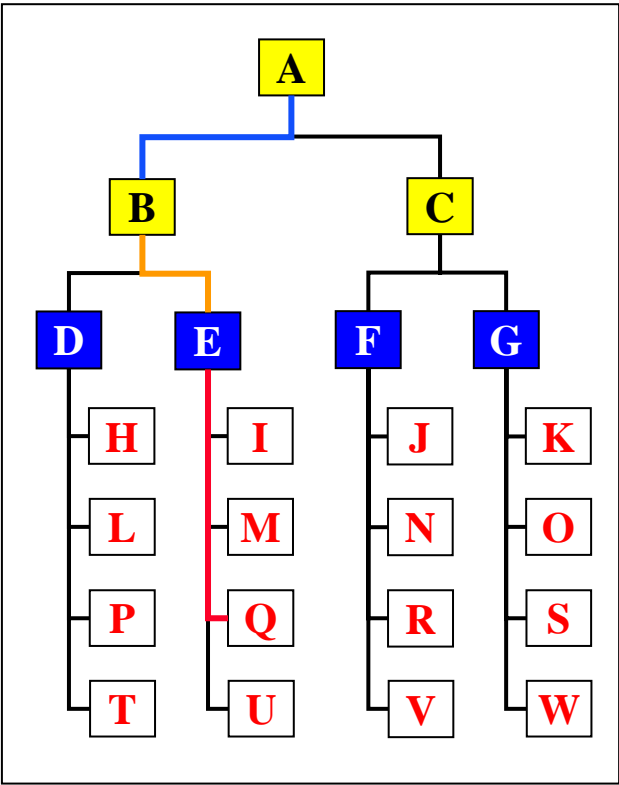


Figure 1: A Tree Graph

Math

Node { B }

Link {(A,B)}

Graph {Nodes} + {Links} =
{A,B,C, ..., (A,B),(A,C),...}

Path {(A,B), (B,E), (E,Q)}

OFSC

Organization

Association

Unit

Relation

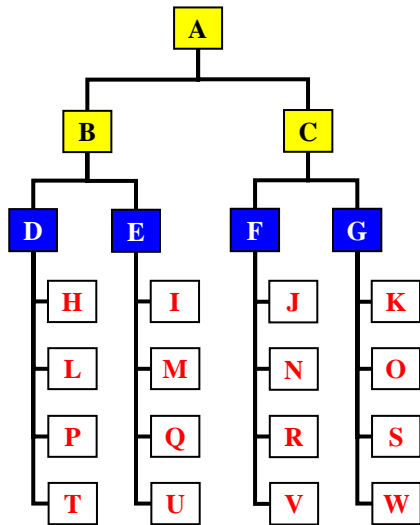
Math: A path exists between nodes A and Q
via links (A,B), (B,E), and (E,Q).

OFSC: A relation exists between
organizations A and Q
via associations (A,B), (B,E), and (E,Q).

GOAL: Formally Define Associations and Relations

OFSC Reasons for Organizations – Aggregation Points

Organization Tree: is composed of organizations **C** and associations. 



C A node denotes an “**organization**” which is just an aggregation point to connect together arbitrary other entities that contain attributes.

There are three reasons to create organizations:

- H** **Billets** (to account for manpower)
- D** **Crews** (to account for self-mobile equipment)
- B** **Doctrine** (implement TTP and C2 with leaders)

The nodes of an organization tree graph may represent either real organizations or classes of organizations, called organization-types. These are never inter-mixed in the same tree. Generically, these are referred to as organization or organization-type trees, resp.

Inventory organization: one that has directly associated manpower or equipment authorizations (all **billets** and **crews**).

Accountable organization: one that has one or more inventory organizations as subordinate organizations.

Active organization: an accountable organization that has personnel authorizations somewhere within its descendants.

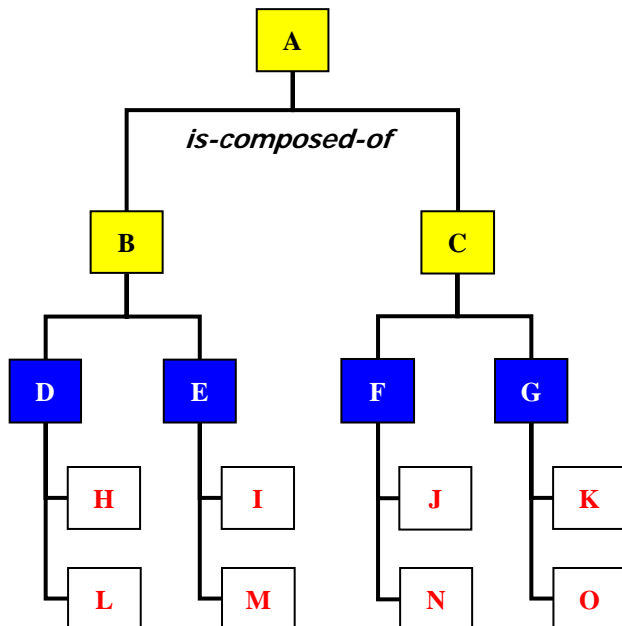
OFSC: Three Classes of Associations – The Meaning of the Lines

An association (ASSOC) is a link between two adjacent organizations (or org-types); the OFSC contains three classes of associations:

Composition

(“is-composed-of”)

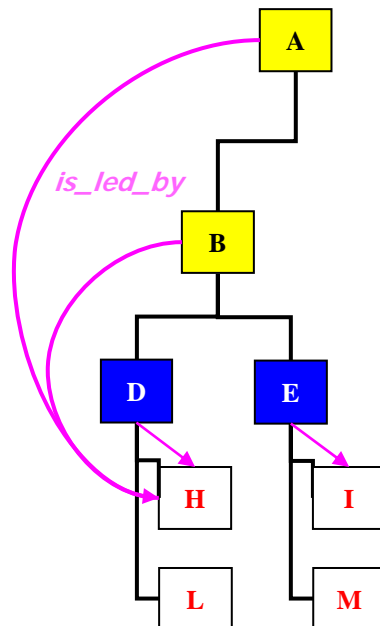
Between any
two Organizations



Leadership

(“is-led-by”)

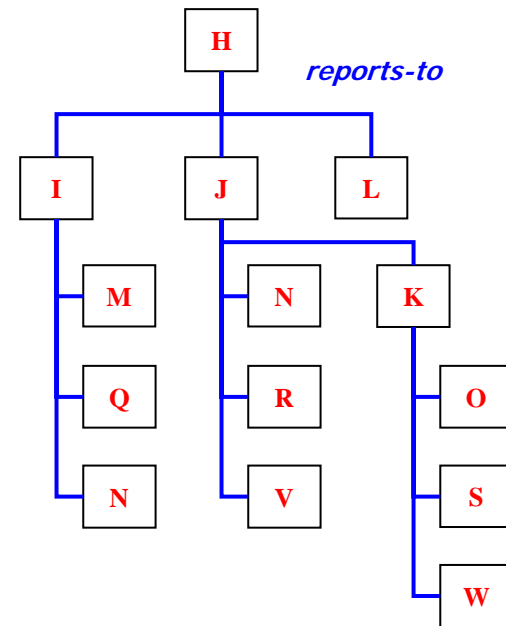
Between an internal
org and a billet



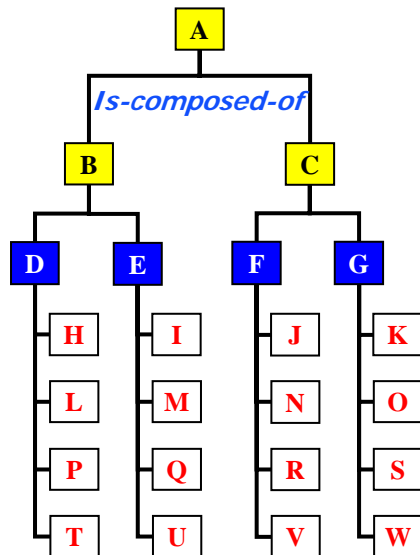
Reporting

(“reports-to”)

Between two billets



Command Structure



Command Structure: “The organizational hierarchy through which command is exercised.”

A command structure is predicated upon the concept of designated leadership authority. This is based on the military premise that anytime people are present, someone is in charge. That is, an Active Organization.

Formally, a **command structure** is a set of composition associations that connect together any type of organization(-type) [**doctrinal**, **crews**, or **billets**] and whose purpose is to denote aggregation due to designated leadership authority (not limited to “command” – any type of leadership).

An organization(-type) tree defined by a command structure denotes a “**unit**”. Many different units can be built from a common set of organization(-type) via different command structures.

- Recall: A composition association indicates aggregation. It is described using the phrase “*is-composed-of.*”
- OFSC Categories/Subcategories for Composition Associations that are used to create Command Structures.:

HAD:	Has Admin / Default	(HSADMI/DEFAULT)
COD:	Combatant Command / Default	(COCOM/DEFAULT)
COA:	Combatant Command / Assign	(COCOM/ASSIGN)
COU:	Combatant Command / Unassign	(COCOM/UNASSIGN)
CCD:	Command & Control / Default	(CMDCTL/DEFAULT)
CCO:	Command & Control / OPCON	(CMDCTL/OPCON)

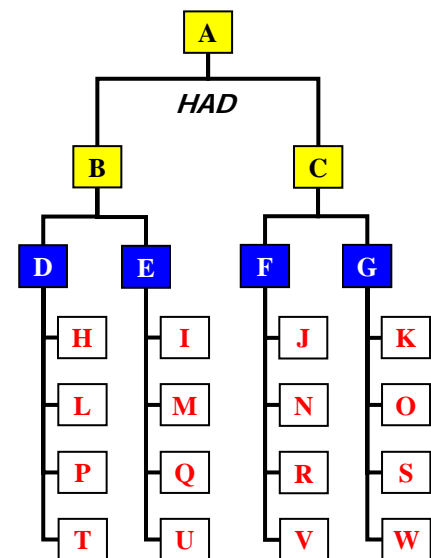
Note:

Names from the NATO C2IEDM: HSADMI , CMDCTL, ASSGND, & OPCON.

New (GFM) Names: COCOM, DEFAULT, ASSIGN, UNASSIGN

OFSC & GFMIEDM HAD Association

Command Structure



HAD: HASDMI/DEFAULT - composition association:

Recall Terms: Inventory, Accountable, & Active organization.

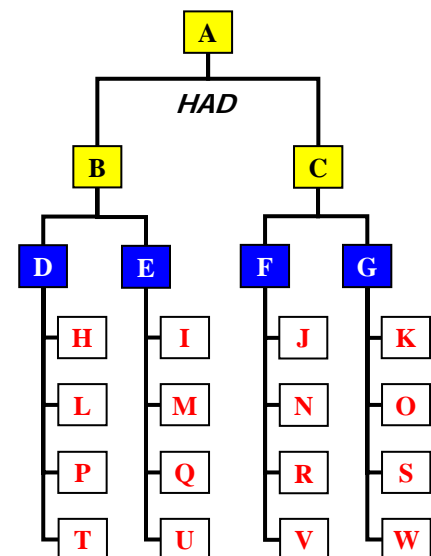
Purpose of HAD associations:

- [1] To identify, account for, and enumerate all personnel and equipment authorizations of a unit.
- [2] To identify and enumerate the organizational leadership of the active organizations of the unit.
- [3] To identify routine organizations used to implement operations and/or tactics, techniques, and procedures.

As a result, by traversing a unit's HAD associations, all of its manpower and equipment authorizations will be discovered, and its routine operational organizations will be identified.

OFSC HAD Association & ADCON Relation Rules

Command Structure



Rules:

- [a] Every inventory organization must have a HAD link, and only one, from its default parent.
- [b] A leadership billet must exist for every active node; preferable with an explicit ILD association.
- [c] The HAD association invokes the OFSC ADCON relation:

$$\text{ASSOC}[A,B,\text{HAD}] \wedge \text{RELAT}[A,B,\text{ADCON}].$$
- [d] The OFSC ADCON relation is transitive:

$$\text{RELAT}[A,B,\text{ADCON}] \wedge \text{ASSOC}[B,D,\text{HAD}] \wedge \text{RELAT}[A,D,\text{ADCON}]$$
- [e] In the absence of any OPCON association, the ADCON Relation invokes the OPCON Relation:

$$\text{RELAT}[A,B,\text{ADCON}] \wedge \neg \exists_x \text{ASSOC}[X,B,\text{OPCON}] \wedge \text{RELAT}[A,B,\text{OPCON}].$$

Examples:

$\text{ASSOC}[\text{II MEF}, 2d \text{ MAW}, \text{HAD}] \wedge \text{RELAT}[\text{II MEF}, 2d \text{ MAW}, \text{ADCON}];$

$\text{RELAT}[\text{II MEF}, 2d \text{ MAW}, \text{ADCON}] \wedge \text{ASSOC}[2d \text{ MAW}, \text{MAG-31}, \text{HAD}] \wedge \text{RELAT}[\text{II MEF}, \text{MAG-31}, \text{ADCON}];$

$\text{RELAT}[\text{II MEF}, 2d \text{ MAW}, \text{ADCON}] \wedge \neg \exists_{\text{OrgX}} \text{ASSOC}[\text{OrgX}, 2d \text{ MAW}, \text{CCO}] \wedge \text{RELAT}[\text{II MEF}, 2d \text{ MAW}, \text{OPCON}];$

US DOD Authority: Administrative Control (ADCON)

The US DOD Authority ADCON is formally represented via the OFSC HAD Association & OFSC ADCON Relation.

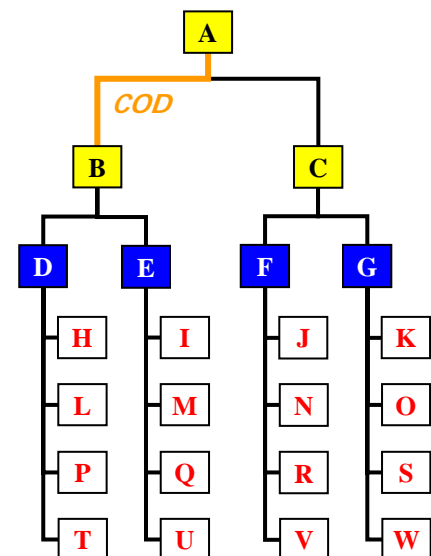
ADCON: Direction or exercise of authority over subordinate or other organizations in respect to administration and support, including organization of Service forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions of the subordinate or other organizations. This is the authority necessary to fulfill Military Department statutory responsibilities for administration and support.

OFSC Interpretation:

- [1] The presence of an OFSC HAD Association invokes an OFSC ADCON Relation that implements the US DOD Authority of Administrative Control.**
- [2] The OFSC HAD Association infers an OFSC OPCON Relation in the absence of any other OFSC OPCON Association.**

OFSC & GFMIEDM COD Association [1 of 2]

Command Structure



COD: COCOM/DEFAULT Association:

The **Combatant Command (COCOM) / Default** association invokes *combatant Command (command authority)* and initiates an OFSC COCOM relation.

The parent organization of a COD association is always a Unified Command (UC).

The COD association implements the assignment process between a UC and its subordinate organizations.

Rules:

[1] **COD association initiates the COCOM Relation and the COCOM Relation propagates via the ADCON relation:**

**ASSOC(A,B,COD) b RELAT(B,C,ADCON) A
RELAT(A,C,COCOM).**

Organizations with a COCOM relationship to a UC are said to be “assigned to” that UC.

Informal: RELAT[A,B,COCOM] A “B is assigned to A.”

Rules (Cont):

[2] Only a direct COD Association can over-ride an existing COCOM relation.

**RELAT(A,B,COCOM) b ASSOC(B,C,HAD) b ASSOC(U,C,COD) A
RELAT(U,C,COCOM).**

[3] An organization can be a child of only one COD association.

Substantiating Statements from JP 0-2:

**Forces, not command relationships,
are transferred between commands.**

A force assigned or attached to a combatant command may be transferred from that command only as directed by the Secretary of Defense.

When the transfer of forces to a joint force will be permanent (or for an unknown but long period of time) forces should be reassigned.

US DOD Combatant Command (Command Authority)

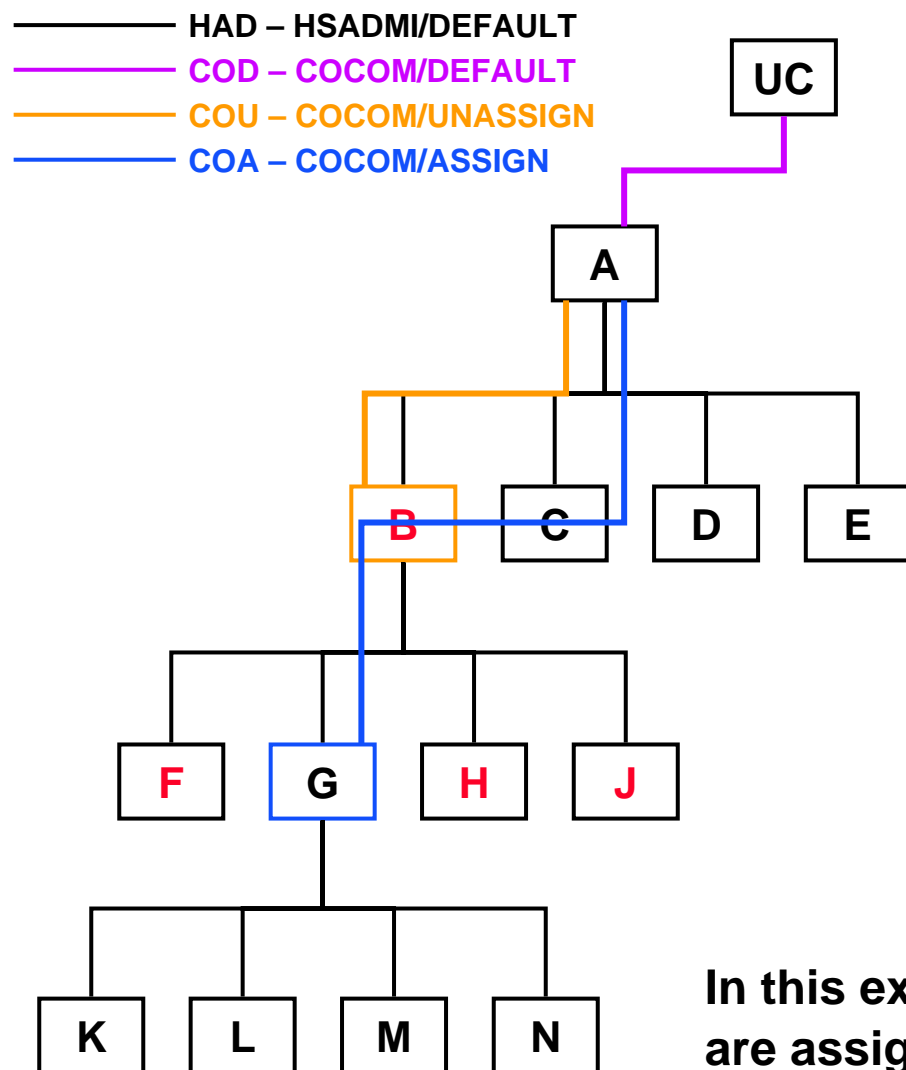
**The US DOD Command Relationship COCOM
is formally defined via
the OFSC COD Association & OFSC ADCON Relation.**

Combatant Command (Command Authority): the command authority over assigned forces vested only in the commanders of combatant commands by Title 10, USC, Section 164, or as directed by the President in the Unified Command Plan (UCP), and cannot be delegated or transferred.

COCOM is the authority of a combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training (or, in the case of USSOCOM, training of assigned forces), and logistics necessary to accomplish the missions assigned to the command.

Joint Publication 0-2: *Unified Action Armed Forces* (UN AAF), 10 July 2001

There Are Always Exceptions – The OFSC COCOM ASSIGN & UNASSIGN Associations



The COCOM Relations propagates down HAD associations via the ADCON Relation. Since there are always exceptions, this must be allowed.

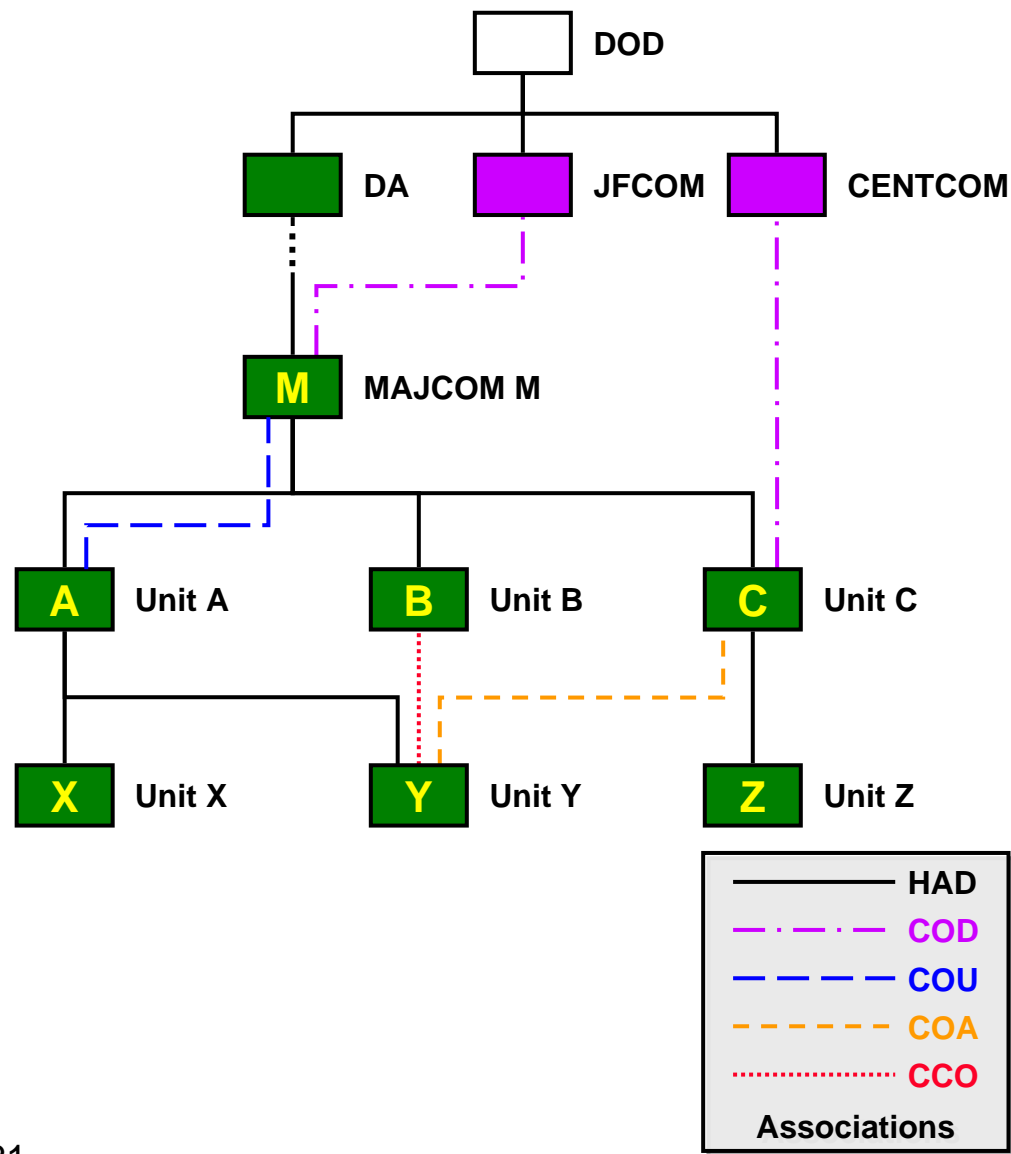
Solution:

Let **COU** be a new association called **COCOM/UNASSIGN** to indicate children to be removed from the COCOM Relation propagation set.

Let **COA** be a new association called **COCOM/ASSIGN** to indicate children that are to be added to the COCOM Relation propagation set.

In this example, G, and all its descendants, are assigned to UC, but **B, F, H, & J** (and their descendants) are not.

Example – OPCON Does Not Over-Ride COCOM



Test:

Who's assigned to JFCOM:

M, B

Who's assigned to CENTCOM:

C, Y, Z

Who is not assigned:

A, X

Note: The CCO Association between Y and B does not over-ride Y's assignment to CENTCOM.



Recall Substantiating Statements from JP 0-2:

Forces, not command relationships, are transferred between commands.

A force assigned or attached to a combatant command may be transferred from that command only as directed by the Secretary of Defense.

When the transfer of forces to a joint force will be permanent (or for an unknown but long period of time) forces should be reassigned.

English:

[1] Proposed definitions:

- [a] Assignable Forces: an organization tree who root has a COCOM/DEFAULT association to it (from a UC) but excluding non-uniformed military positions [i.e., excluding civilians].
- [b] Assigned Forces: the set of all assignable forces, minus exceptions, for a particular time period.

Summary

1. ***“Force structure pulls everything together.”***
2. ***The GFM Organizational and Force Structure Construct (OFSC) provides the semantics for formally defining force structure.***
3. ***The OFSC is being used to formally define the US DOD joint processes of Assignment, Allocation, and Apportionment.***
4. ***Command Structure: “The organizational hierarchy through which command is exercised.”***
5. ***The default association in an OFSC command structure is Hs-Admin/Default (HAD) that define the OFSC ADCON relation that is used to represent the US DOD Authority Administrative Control.***
6. ***The US DOD Command Relationship COCOM is formally defined via the OFSC COD Association & OFSC ADCON Relation. COCOM Authority is initiated via the OFSC COD Association.***
7. ***Exceptions are handled via the COCOM Assign and Unassign associations.***